

OBJECTIVE 3.9 Identify types of power assist steering loss and acceptable methods of minimizing potential loss of vehicle control.

INTRODUCTION

Performance of the power steering system in some vehicles is such that a brief or total loss of power assist may be experienced by certain drivers in circumstances where there is aggressive steering input or during rapid and successive changes in the direction of steering wheel rotation. It is imperative to alert officers to the possible impairment in vehicle steering capabilities in order to minimize the potential for losing control of the vehicle.

CONTENT

An analysis of vehicles traditionally utilized for law enforcement purposes has shown that the power steering assist function may become impaired under extreme foreseeable conditions. More specifically, the steering wheel becomes difficult to turn when executing a series of quick turns or swerves with the operators foot off the accelerator pedal. This condition can occur at relatively low speeds and becomes more pronounced at higher speeds and/or when braking during maneuvers.

The following represent the types of occurrences that could be experienced as a result of an impairment of the vehicle steering capabilities:

1. **Steering Wheel Bind** - Significant and abrupt slowing of steering wheel rotation from a rate of approximately 1000 degrees per second (3 full rotations of the steering wheel in one second) to a level on the order of 100 degrees per second within a time frame of approximately 200 milliseconds, however, during which the steering wheel did not come to a complete rotational stop.
2. **Lockup** - Significant and abrupt slowing of steering wheel rotation of approximately 1000 degrees per second to a complete rotational stop within a time frame of approximately 2000 milliseconds, followed by a stationary position for 20 to 100 milliseconds and finally, continued rotation of the steering wheel in the original direction.
3. **Kickback** - Significant and abrupt slowing of steering wheel rotation equivalent to that experienced in lockup. In spite of continued driver effort, reverse rotation of the steering wheel caused by counter torque in the steering system. These events are rapidly followed by a

second complete stop of the steering wheel, then by rotation in the original direction as the driver continues to apply torque in that direction.

PRACTICAL ROAD TEST

The road test course selected to create the aforementioned problems with power steering in a training scenario is a widely accepted, precision type, night maneuverability test circuit. This type of course provides a good representation of the types of situations potentially presented in congested urban environments which, when driven in a very aggressive manner as might be anticipated during law enforcement/emergency responses, would be sufficient to evaluate the onset of steering wheel bind, lockup or kickback. The recommended course for training officers to recognize and correct for the above power steering phenomena is found in Chapter 8 of this manual and entitled "Cumulative Skills Pursuit Course C."

VALIDATION

In order to provide maximum efficiency, the student must negotiate the course with a maximum elapsed time of 29 seconds, while avoiding impact with all the traffic cones defining the course. Drivers are instructed to consider that each cone represents a pedestrian, another vehicle or a fixed object. These qualifying criteria were determined to require sufficiently aggressive driving to precipitate the onset of power steering failure.

SUMMARY

The intent of the power steering failure exercise is to familiarize officers with the potential hazards of exceeding the capabilities of their motor vehicle. With proper instructions, officers should be able to recognize driving behavior that is not conducive to complete control of the steering mechanisms of their vehicle and provide them with the ability to correct the problem, should they experience it during the operation of their emergency vehicle.

SUGGESTED INSTRUCTIONAL METHODOLOGY

CLASSROOM PRESENTATION

In a classroom setting, explain to the students the problems that they may encounter with the power steering assist system. Students should understand the concepts of steering wheel bind, lockup and kickback, how to avoid the problem and, if encountered, how to minimize the hazard.

RANGE

The recommended course for training officers to recognize and correct for the above power steering phenomena is found in Chapter 8 of this manual and entitled "Cumulative Skills Pursuit Course C".

The exercise itself includes a series of "Drop Throttle Serpentine" tests, a series of quick turns of about one full rotation of the steering wheel, with the drivers foot removed from the throttle pedal. These tests should be performed at a beginning speed of 35 mph and repeated a 5 mph increments up to a 55 mph maximum.

RESOURCES AND AIDS

1. Articles and publications
2. Manufacturer instructions, manuals, and bulletins

SUGGESTED EVALUATION METHODOLOGY**STUDENTS**

1. Written or verbal responses to questions on types of power steering phenomena likely to be encountered in emergency vehicle operation.
2. Observation student identification of types of power steering phenomena encountered during simulated emergency response activities.
3. Observation student correction for types of power steering phenomena encountered during simulated emergency response activities.

COURSE

1. Observe on-the-job use operation of power steering in emergency operations.
2. Review agency collision reports to determine if power steering practices during emergency operation contribute as causes for duty vehicle crashes.

